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ABSTRACT

The purpose of this publication is two-fold: to show how the natural features on campuses can be used effectively in environmental education and to plead for preservation of as much of the natural landscape as possible on new school sites. Since opportunities for teaching about nature are easily found on the grounds around a school, this booklet outlines briefly some of the ways teachers can make the most of this opportunity, and gives sources for additional material and assistance. Campus and program development discusses the outdoor site, classroom preparations, and project ideas built around the history of conservation, plant life, animal life, nonliving elements of the environment, light, water, weather, temperature, soil, minerals, and fire. Trails, signs, amphitheaters, ponds, weather stations, and models that can be built or developed at the outdoor learning facility are enumerated under teaching aids. The final section suggests additional projects which can be undertaken with little preparation necessary--leaf identification, snow study, animal food habits, habitats, fireplace construction, cooking, compass skills, insects, clouds, measurement, growing plants, seeds, birds, trees, soil study, moisture and rain gauges, pond life, food manufacturing, decomposition, climbing plants, and woodlands. A bibliography is appended. (BL)

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# USE THAT CAMPUS

## The time is late . . .

AN APPEAL TO TEACHERS AND ADMINISTRATORS

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USE THAT CAMPUS

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# USE THAT CAMPUS

The purpose of this publication is two-fold: To show how the natural features on campuses can be used effectively in environmental education, and indirectly to plead for preservation of as much of the natural landscape as possible on new school sites. It is not designed as a permanent guide for teachers to use in developing curricula incorporating natural sciences—it does not include any of the multitude of opportunities in the language arts, mathematics, or other subject areas. Many educational opportunities exist in all of these subject areas and when teachers step into the out-of-doors, the opportunities for learning in all fields will become evident—what French teacher could help translating for her students the word "la fleur" (flower)?

Educators today are coming to recognize the urgent need for children to learn about mankind's dependence on natural resources, a dependence that is no longer self-evident in a society where the water comes from faucets and heat from wall sockets. Today's students must come to understand the relationship between man and nature if we are to have in the future the sustained public support that will be essential in protecting a threatened environment.

Ideally we might like to have outdoor education centers available everywhere, staffed by teachers highly trained in environmental education but the need cannot wait for that. We must begin now to show young people what makes the world tick, and how man fits in.

One of our best opportunities for teaching our children about nature is often overlooked. It is just outside your window, on the grounds around your school. Here the elementary school child's natural curiosity about the outdoors can make the learning process enjoyable and exciting. This booklet outlines briefly some of the ways in which teachers can make the most of that opportunity, and gives sources for additional material and assistance.

## CAMPUS AND PROGRAM DEVELOPMENT

The settings of most elementary schools in the Tennessee Valley are suitable for use as environmental educational facilities. Most have one or two acres of undeveloped woodland or grassed area adjacent to the school building or nearby. Unfortunately, it is the vogue with planners and builders to devegetate and level school sites in the course of construction, removing all naturalness from the scene. It would take little effort to assure the protection of the existing trees and topography whose destruction is not essential to the new structural complex. And they could be used to great advantage. The duplication of the variety of flora and fauna normally present on proposed school sites would be costly, time-consuming, and probably impossible to duplicate once removed. Leaving it would save considerable money and add tremendously to the potential for classroom use.

To achieve full benefit of short projects out-of-doors, classroom preparation is essential. A discussion of the subject before it is actually encountered gives the student certain important points or clues to look for and presents him with an explanatory background more difficult to get across later. In addition the benefits, problems, effects on man, and man's effects on the subject can be explained so that the student has a meaningful grasp of the project situation.

Any number of field trips or short outings into a nearby wooded area can be built around discussions of the following major categories:

(1) **History of Conservation**—Most subjects which deal with nature have a historical background. Rather than a series of lectures, a word about the past (the pristine condition, man's effects, laws) will put new perspective on the point of interest.

(2) **Plant Life**—Teachers should be acquainted with the common trees, shrubs, and animals which will likely be encountered outside the classroom. Excellent guides are available through the University of Tennessee, the U. S. Forest Service, the U. S. Soil

Conservation Service, the National Park Service, and other agencies. A basic knowledge of plants, available in any high school biology book, will be of great help. Teachers might want to know how a plant uses water, air, light, and minerals; what the plant produces; the major identifying features; the functions of a leaf, stem, flower, fruit, and root; where plants are found; where they do not occur and why; how man uses plants; how plants fit into the food chain of all animals.

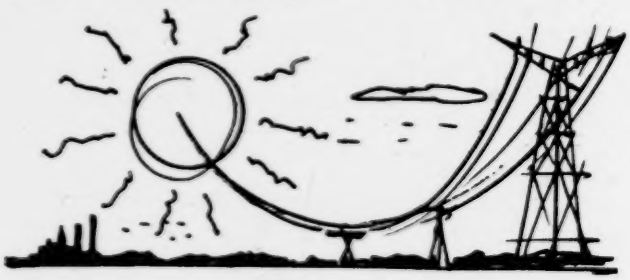
The above can be a formidable list, but it needn't be. Remember, the presentations must be short and simple. Expert, detailed knowledge is neither required nor necessarily desirable. The teacher is expected merely to introduce such material.

(3) **Animal Life**—Again, it is not required that a teacher know something about all animals or everything about one. Basic information to be found in any biology book is enough—for example, the common classes of animals: mammal, bird, reptile, amphibian, fish, insect, spider, worm, sponge, protozoa, mollusc. Representatives of each will be near the school and the common ones should be known. The teacher also should be able to tell what each common

animal eats; who its enemies are; where it is usually found; why it's there; something about its life history; its ability to produce young; its effect on man; man's effect on it; its effect on other plant and animal life; the effect of plants and other animals on it; its dependence on sun, light, water, and minerals.

(4) **The Nonliving Elements of the Environment**—Just as no plant or animal lives without the influence of other living creatures around it, neither does life occur without influence from its nonliving surroundings. Since these elements are so important to life, it makes sense to tie life to its physical environment in teaching youngsters of any age.

**Light**—Energy may be transformed into different types (light, heat, chemical, mechanical) and can be stored, but once lost, it cannot be regained. Energy transfers are never 100 percent efficient. Therefore,



each time energy is changed from one form to another or is passed from one organism to another, some is lost. Here the teacher can emphasize the importance of the sun for our existence.

**Water**—Life as we know it cannot exist without water. Water is a physiological necessity for all protoplasm. It comes to us most frequently as rain or snow, but its continued availability in this form is dependent on the hydrologic cycle of

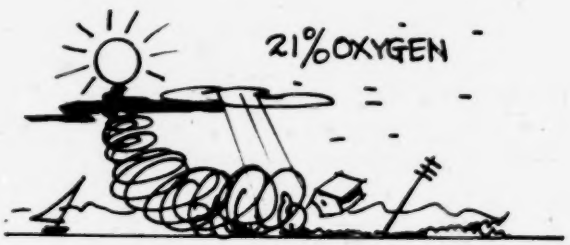
evaporation-precipitation-runoff to the sea. Precipitation amounts and seasonal timing, along with temperatures, regulate natural vegetation types (and indirectly, animal types) which live in any geographic area.

Water is found in many forms on the earth—rain, snow, sleet, hail, dew, fog, clouds, ponds, lakes, and rivers. It is also locked into plant and animal tissues and in our soils. Ground water is found below the surface and water is a part of most minerals.

Water has a great influence on climate, on soil formation, and on the plants and animals of a region. It is a medium supporting aquatic life as air supports terrestrial life. One of our greatest problems today is that water being used to remove man's ever-increasing domestic and industrial wastes is becoming so overloaded with foreign matter (chemical and particulate) that at some locations it requires massive treatment before it can be used domestically or recreationally. Perhaps the best solution to this problem is severe restriction of pollutant admission into rivers and lakes.

Water, in the form of rivers, lakes, and ponds, provides habitat for animal and plant communities radically different from those found in terrestrial settings. Fish, amphibians, birds, insects, molluscs, algae, and aquatic plants which are common to ponds and streams should be familiar to the teacher. It is interesting to note the variability in forms and to compare adaptations between aquatic and dry land forms.

**Weather**—Few subjects affect our actions and temperaments as constantly as the weather. Meteorology—the study of the atmosphere and phenomena occurring in it—is most interesting and important for all to appreciate and understand. Air is all around us. Its 21-percent oxygen content is essential to plant and animal life, to soil formation, to geologic weathering. Air also can carry moisture, other gasses, odors, and dust. Smoke from our factories, fumes from our automobiles, dirt from roads and industry enter the air we breathe. Like water, air has been taken for granted as an unlimited medium for pollution dilution, and like water, we find there are very real reachable limits. The safe limits have been passed in many parts of our country. Without increased and constant watchfulness man can easily produce air unfit for his own use.



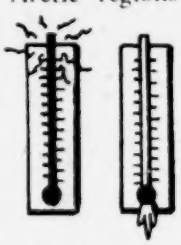

Moving air (wind) is interesting. All wind can eventually be traced to the energy source of the sun. Is wind important? Yes, indeed. Wind distributes and disperses many types of plant seeds; it can drive ships, pump water, destroy cities, bring clouds and rain, cool a sweaty brow, push a lake out of its basin, hold up a kite, or blow away a whole region's topsoil. Its direction and force are easily measured.

Air is heavy. At sea level, nearly 15 pounds per square inch press against all objects—top, sides, and bottom. Air gets thinner with altitude, and the pressure diminishes. Since air has mass, airplanes and birds may fly. Lateral surface pressure differences cause wind. A common barometer can demonstrate air pressure changes, but simple weighing an empty vs. an inflated balloon shows that air has weight.

An important function of air is to carry moisture—humidity. Clouds are visible evidence of water vapor condensing, but clear air usually contains invisible water vapor. High humidity is often responsible for the uncomfortable sticky feeling on hot summer days. Low humidity drys the skin as it allows increased evaporation rates. Transpiration in trees is low when the humidity is high, and high when the

humidity is low. Rapid evaporation rates may be shown by the temperature reduction resulting from swinging a thermometer with its bulb covered with a piece of dampened cloth.

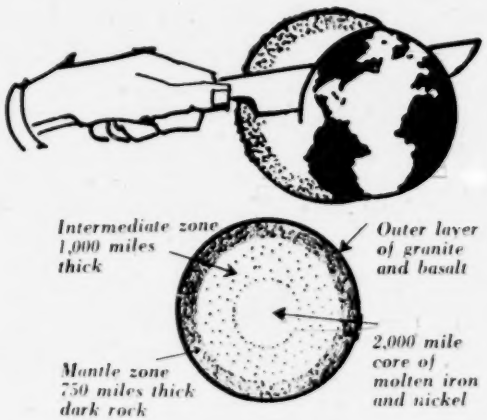
**Temperature** is a most important feature of our environment. Life in any form cannot exist except within a relatively small range of temperature extremes. Temperature rhythms, daily and seasonally, along with rhythms of light and moisture, largely control times of activity of plants and animals. Temperature is often responsible for limiting the range and habitat for organisms. Arctic regions support fewer types and numbers of animals and plants because most cannot withstand the rigors of extreme cold, drouthy conditions, and the long periodicity of seasonal light. Foods for vegetarians are scarce and food chains are short. Conversely, the temperate zone with its stimulating seasonal changes is filled with a tremendous variety of plants and animals adapted to fill nearly every conceivable niche in soil, grass, trees, air, and water.



Adaptations to temperature variation take many forms in plants and animals. In winter, some plants die, leaving seed behind to germinate the following spring. Others die back to the root, only to sprout again after winter is over. Deciduous trees cease their growing processes, drop their leaves, and lie dormant during winter months, while evergreens only slow down until the weather warms. Animals have an even greater variety of responses to cold. Some sleep all winter (bears), some hibernate (chipmunks, nighthawks), some migrate from mountains to the valleys (deer, elk, songbirds), others remain active (voles, squirrels, titmouse, chickadee) but change their feeding and other behavior to fit the season. Some creatures change their covering to white (snowshoe hare, ptarmigan) to be less visible against a snow background; most mammals store fat and grow heavier coats to use during the cold season.

Spring and summer temperatures likewise bring changes. This is the time for new plants, new growth; a time for most creatures to have their young. Food is plentiful and the weather is warm.

**Soil**—Soil has been defined as any of the earth's mantle which supports plant life. It is a product of parent rock, weathered minerals, water, living organisms, and their remains. A very interesting demonstration of soil can be made by cutting a vertical section into the ground to show the various layers: litter, duff, leafmold, humus, leached, mineral, and parent material.




**Minerals**—All living organisms on the earth depend, directly or indirectly, upon minerals to supply essential elements. Minerals are natural compounds of elements making up the earth's crust. Most of us seldom think of their importance. Let's look at just a few: (1) common table salt (NaCl) is a mineral, mined from naturally occurring deposits or extracted from the sea. Without salt, our food would taste flat. But more important, without the sodium in salt, which maintains fluid balance in animals and which is responsible for healthy cells, we could not live. Similarly, potassium, calcium, magnesium, and others are required elements found in natural minerals.

Rocks are nonuniform mixtures of minerals. Deposits of a single mineral are relatively rare, but rocks are to be found almost anywhere. When geologic weathering occurs, rock and mineral wear down, split, chemically dissolve, and generally break down into smaller parts such as clay particles or sand. These fine particles become incorporated into soil and the minerals become available to plants and animals.

**Fire**—Even though fire is a natural phenomenon of our environment, it is generally thought of as a danger and a plague in the forest. Mankind learned early to use fire for warmth and for cooking. He learned to use set fire for scaring game into the open. But when man built cities and developed valuable farmland, uncontrolled fire was one of his worst enemies; hence, fire departments and lookout towers.

A fire in the forest is awesome. It sweeps across the land, roaring, searing, belching flame and smoke, and killing everything that is caught in its path. But after the fire is past, new sprouts come up, often of different species than those destroyed. A whole succession of plants replace one another until finally trees similar to those originally burned come back. This normal succession of plants is especially suited to certain animals during each stage of their return to the forest. For example, birds attracted to burned forest in the Southeast might be as follows:

| | |
|---|---|
| 1 to 3 years after fire | grasshopper sparrow<br>meadowlark |
| 2 to 15 years after fire | field sparrow<br>yellowthroat<br>chat |
| 10 to 35 years after fire | cardinal<br>towhee<br>prairie warbler |
| 25 to 100 years after fire | summer tanager<br>Carolina wren<br>wood pewee |
| 75 & more years after fire | wood thrush<br>cuckoo<br>vireo<br>titmouse<br>hairy woodpecker |

Succession after fire adds diversity to the forest, both in plants and animals. Small scale succession studies can easily be prepared on a 10 x 10-foot plot of ground by spading it up and comparing the plant life from one year to the next.

## OUTDOOR TEACHING AIDS

An outdoor learning facility can be developed just outside your window or on a vacant lot nearby. (Perhaps a piece of land donated to the school or a centrally located park can be used.) Several teaching aids can be built on whatever land is to be used.

Nature trails, complete with interpretive signs, observation points, resting places, and pavement where needed, can be a great help. The instructor will quickly become familiar with many interesting features along an oft-used path and the class will be more apt to remain grouped.

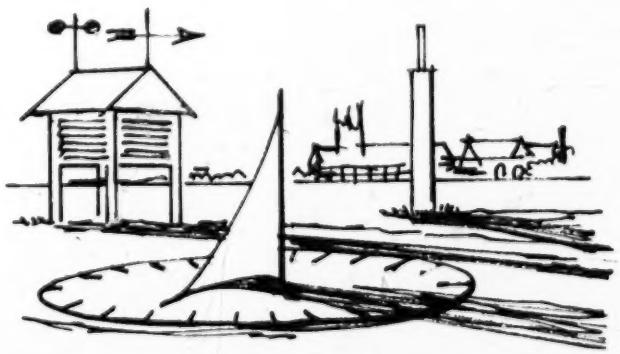
Trails should follow existing topography to avoid excessive grades. Width suggested is 4 feet to allow two people to walk abreast. A farm tractor and plow or a small garden plow can be used to make trails, but often it is desirable for the children to help in trail building. Tread may be gravel, pavement, wood chips, pine needles, or simply indigenous material. Steep banks formed during trail establishment should be planted with grass to avoid erosion. Signs might be placed along the trail identifying trees, animal dens, bird nests, and plants.

It is useful for teaching purposes and for recreation to establish an area where a class can sit down in the outdoors. This can be a multipurpose center, designed to include an expandable seating capacity, a portion on which a camp or cooking fire may be built, and a paved area which may be used for lectures, demonstrations, and other gatherings. This is a possible location for a water fountain, bird feeder, weather station, or other helpful facilities.

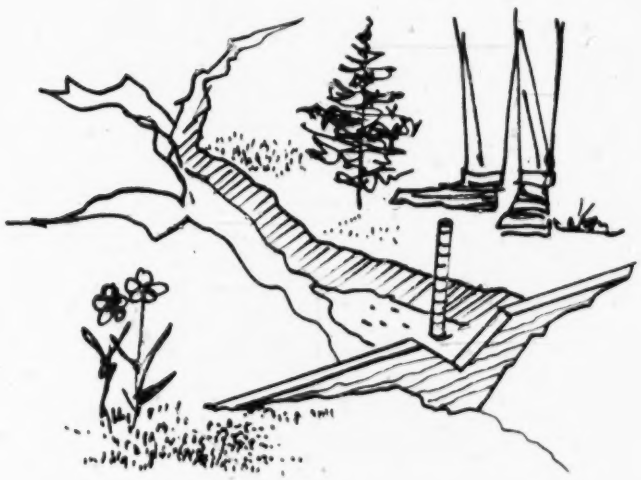
There are numerous possible designs for an amphitheater. One is sketched below.

Many school grounds have small drainages or gullies suitable for constructing a small pond which will offer a plant and animal community vastly different from any dry land community. Construction can be inexpensive. Part of the trail system can lead to and across the dam. In some instances, a supplementary water source is required to maintain the pond in dry seasons. This may require a pipeline from the school to the pond.

Weather stations containing or adjacent to instruments which measure temperature, humidity, wind direction, wind velocity, and time of day by the sun can be attractive and interesting. Such a complex can demonstrate hydrologic principles as well as form a basis of understanding weather, especially if one station is completed in the open and another constructed in a forested location.



Small models demonstrating erosion and correction methods can be easily prepared by students. For example, on a suitably steep slope, clear a 3 x 10-foot area. After an erosion gully is formed, install a small wooden retaining dam to form a silt catch-basin to measure amount of soil movement. Part of the gully complex can be planted to quick-growing grass to demonstrate how vegetation controls the erosion process.

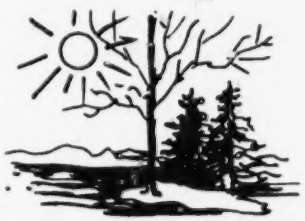


## SOME SUGGESTED PROJECTS

Below is a list of suggested projects and discussion items which can be undertaken with very little teacher preparation. Before any are undertaken, a little advice might be helpful. Success depends largely on (1) creating anticipation in the classroom, (2) having manageable groups (ideally no larger than 10), (3) making the outing short and simple, and (4) maintaining appropriate discipline.

**Leaf Identification**—Collect a leaf for each student from the common tree species. Let the class find trees with matching leaves. Tell something about each kind of tree. Draw the leaves.

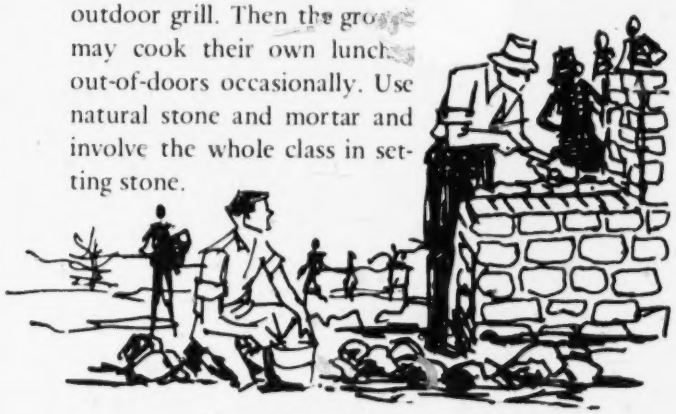
**Snow Study**—Ask why snow instead of rain. Discuss temperatures, seasons, importance of moisture. Show snow remnants under trees when open areas are dry. Ask why. Discuss importance of sun to life. Show picture of snowflake. Search for good crystals in field.



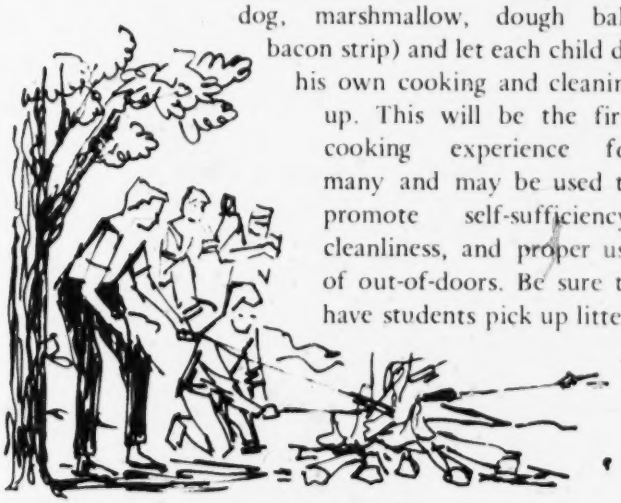
**Animal Food Habits**—Point out different foods in woods and fields—nuts, other seeds, grass, tender shoots, rotten wood, insects, birds, mice, and snakes. Ask of each, "What eats this?" "How do you tell?" Discuss different types of teeth, gizzards, bills, and explain the diversity. Discuss food chains and the energy flow from sun to plants to animals up to top carnivore.

**What Lives Here?**—Discuss various habitats (grass, briars, trees, caves, stumps, rotting logs, soil, marsh, lakes) and mention several animals associated with each. Talk about how each animal uses the particular area to its advantage. In the field, point out different types; look for animals or sign.

**Fireplace**—A year's project for the class would be to draw plans and construct an outdoor grill. Then the group may cook their own lunches out-of-doors occasionally. Use natural stone and mortar and involve the whole class in setting stone.

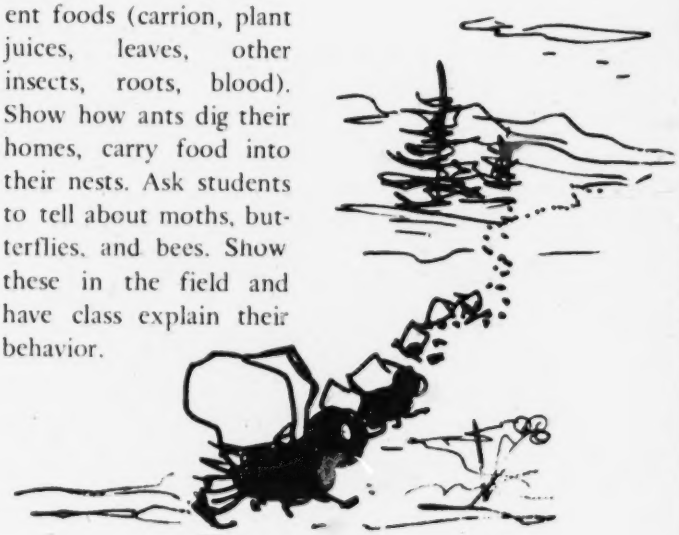


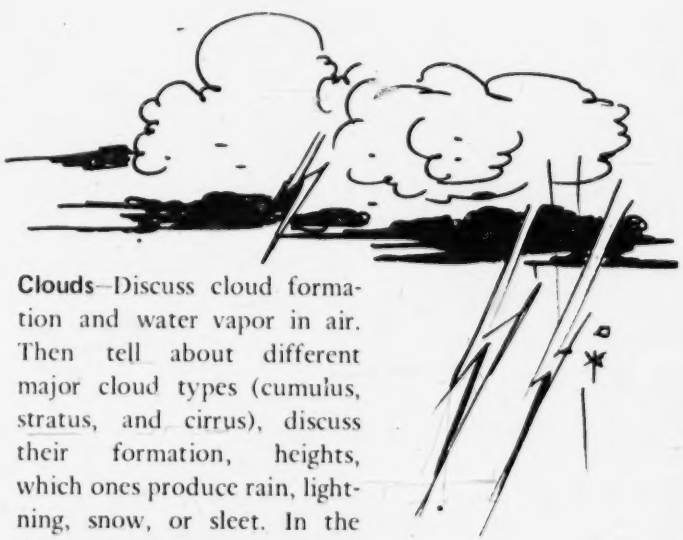
**Cooking**—At least twice a year have each group cook and eat lunch. Make it simple (hot dog, marshmallow, dough ball, bacon strip) and let each child do his own cooking and cleaning up. This will be the first cooking experience for many and may be used to promote self-sufficiency, cleanliness, and proper use of out-of-doors. Be sure to have students pick up litter.



**Compass**—Discuss primary directions and magnetism. Show how a compass works and tell how it is used for map making, direction finding. In the field, use a compass to map a small area. Show how to use it if lost—blindfold a child, lead him southward, give him the compass and let him return by following the needle northward.

**Insects**—Discuss how insects are everywhere, and their good and bad aspects—food for fish, birds; plant pollination; parasites; products like honey. Discuss different nests (paper wasps, mud daubers, on trees); different foods (carrion, plant juices, leaves, other insects, roots, blood). Show how ants dig their homes, carry food into their nests. Ask students to tell about moths, butterflies, and bees. Show these in the field and have class explain their behavior.





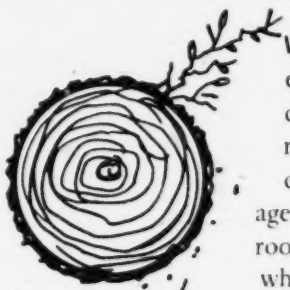
**Clouds**—Discuss cloud formation and water vapor in air. Then tell about different major cloud types (cumulus, stratus, and cirrus), discuss their formation, heights, which ones produce rain, lightning, snow, or sleet. In the field, point out the cloud types and ask class to tell about them. Also discuss wind, its causes, strength, and uses by man. Fly a kite.

**Measuring**—Discuss how to measure distances (speedometer, pacing, estimating), tell difference between linear measurement, area, and volume. Show how to measure pace and from there let each student measure a known distance by walking. Use glasses and milk cartons to demonstrate volume and use an open lot to show area.

**Birds**—Discuss birds, what they eat, where they live, where they nest, feathers, bills, colors, and size. Use sunflower seed to attract birds to feeder and also nail suet to a tree. Teach identification of common birds (mourning dove, cardinal, titmouse, chickadee, white-throated sparrow, bluebird). Let class set up two or three birdhouses and feeders on school land so they may be observed from classroom. In field, let students identify birds and point out nesting places for different species. Listen for calls.

**Grow Something**—Let the class dig up a small area and plant onions, radishes, or carrots. Each week let them weed the area and watch their plants grow. When plants mature, use product in a lunch so students understand where these foods originate. The garden spot can then be allowed to grow up naturally for a few years to demonstrate plant succession.

**Why No Leaves?**—Show difference between evergreens and deciduous trees. Discuss tree rings with sawed-off limb for demonstration. Show how to age tree. Discuss function of roots, bark, stem, and leaves while in the fields.



**Soil Study**—Discuss good and poor soil. In field, dig into soil and show the important layers (litter, organic, mineral, and bedrock). Show how erosion carries away soil by exposing steep section to rain.

**Seeds**—Discuss the importance of seeds. Tell about how seeds are dispersed (wind, water, attached to clothes, animals, some pass through bird digestive tracts). Show examples of winged seeds, cockleburrs, and milkweed. Ask why so many must be produced and what happens to those which do not form new plants.

**Rain Guage**—Discuss the importance of moisture to plant life—to all life. Without water, clean water, we are all in trouble. Tell about deserts, arctic conditions, rain forests, and compare with our deciduous forest and our ± 50 inches of precipitation a year. Place a rain guage in school yard and keep a chart of moisture received.

**Pond Life**–Discuss what lives in and around ponds–insects, fish, frogs, dragonflies, mosquitoes, cattails, lily pads, and worms. In the field conduct a search for any and all types of life. Discuss how requirements of pond dwellers are different from inhabitants of fields and forests. Keep small aquarium in classroom with a few pond weeds and guppies.

**Food Making**–Trees manufacture their own food. Their green leaves or needles are food factories. Inside the leaves carbon dioxide gas from the air and water brought up from the roots through small tubes combine to form sugar with the aid of sunlight. If we could do the same, we would never have to visit the grocery store.

**Return to the Soil**–Even though dead and lying on the ground, a tree's job is not finished. It will return minerals to the soil which were borrowed when the tree was growing. To do this, the tree has many helpers. Mushrooms grow on and into the wood, helping to crumble it. Beetles, centipedes, millipedes, and many forms of small creatures dig into and eat the old wood. The lichens, mosses, and grasses on the trunks help to decay it. In a few years the log will be returned to the soil to make the ground richer for other trees.

**Plants That Climb**–There are three types of climbing plants in most woods. First, the greenbriar or catbriar which has sharp thorns and green, shiny stems. The greenbriar produces dark berries eaten by many birds and other animals. Second, the grapevine, which may be recognized by its shreddy bark and large, juicy fruit. The vines often support nests of various kinds and the fruit is eaten by more than 30 kinds of animals. Third, is poison ivy. The rootlets cling to the tree bark and it has three shiny leaflets. This is a poisonous plant to beware of, since touching it may bring out a red rash which hurts, itches, and spreads. A rule to remember is: Leaflets three, let it be!

**Soil Making**–Soil consists of finely broken mineral rock mixed with remains of living plants and animals. In addition, most soil contains roots and animals still alive. Look at any rock exposed to the surface for a long time–see the crust-like plants (lichens) growing on it. These lichens hug the bare rock and produce an acid that slowly erodes the rock surface. Later the crumbling rock can support the pale green, leafy lichens. Finally, mosses can grow along with the leafy lichens, then grasses, then bushes, and lastly trees. This takes a long, long time–probably only a spoonful of soil has formed from this rock since the time you were born.

**The Woodland**–Trees are certainly friends of the earth. Their overhead leaves give shade from the sun, shelter from the wind, soften the fall of rain, and add moisture and oxygen to the air. Later, when the leaves fall to the ground and rot, the soil is made more fertile. Many animals live in the woods: worms, insects, and moles in the soil; squirrels, owls, and woodpeckers in hollow trees; catbirds, blue jays, and warblers in the tree branches; foxes, chipmunks, and rabbits in underground burrows–all these animals find food and shelter in the woods. Many of them help the trees by eating insects, improving the soil, and spreading tree seeds. Each plant and animal benefits the community in which it lives.

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